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(12) # EUROPEAN PATENT APPLICATION

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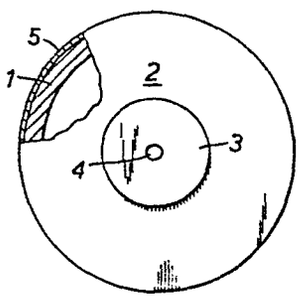
(54) **Ceramic coated rolls.**

(57) This invention relates to a ceramic coated roll for transporting strip material eg. stainless steel strip. In particular, the surface of the roll (1) is initially finely ground and then spray-coated with at least one layer of a ceramic material (5); the surface is then finished by linishing. Rolls in accordance with this invention have been used on softening and descaling stages in a stainless steel strip processing line and the integrity and the average life time of these rolls has been found to be much better than their asbestos coated counterparts, showing a marked cost saving.



EP 0 091 292 A1

CERAMIC COATED ROLLS

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This invention relates to transport rolls, and more particularly relates to rolls for transporting high grade steel strip.

In the transportation of such strip, especially whilst hot, e.g. in excess of 1000°C. as during processing through annealing stages, great care has to be taken that the strip is not marked by its passage over these rolls. The surface finish of such rolls is thus of great importance and since conventional high grade steel rolls cannot be used, at least with steel as the strip engaging surface because of mutual scaling problems on the strip roll, asbestos-surfaced rolls have hitherto been used in these applications. The useful life of these rolls however, is short-lived since they wear and quickly develop a negative or hollow camber deforming the hot strip and causing strip tracking difficulties. Such rolls can also break up giving rise to ridges along the length of the strip.

It is an object of this invention to mitigate these problems.

From one aspect, the present invention provides a strip transport roll, the surface of which has been finely ground and then spray coated with at least one layer of a ceramic material and surface finished by linishing.

Preferably, the roll comprises a tubular steel body with provision for water cooling from within. The tubular steel surface may be turned and/or shot peened prior to grinding and the ceramic deposit may comprise a first layer having good adhesion qualities with the steel body and a surface layer having good wear resistant qualities. A yet

further layer may be"sandwiched" between the two ceramic layers to distribute the thermal stresses occurring during operation.

Rolls in accordance with this invention have been used experimentally on softening and descaling stages in a stainless steel strip processing line, more particularly between and adjacent annealing furnaces and between the latter and at least the first of the subsequent cooling stations,but they could of course be used elsewhere in these stages. The integrity and the average lifetime of these ceramic coated rolls has been found to be much better than their asbestos counterpart showing a marked cost saving. In addition of course, the health concern and care necessary with the use of asbestos is of no consequence.

In order that the invention may be fully understood, one embodiment thereof will now be described by way of example, with reference to the accompanying drawing, which schematically illustrates a side elevation of a water-cooled ceramic coated strip carry-over roll.

Referring now to the drawing, the roll comprises a mild steel tube 1 having end plates 2 with bearing stubs 3 welded on, the bearing stub at each end having a centrally disposed bore 4 therethrough for the entry and exit of water for conventional cooling purposes. The thickness of the steel tube is selected to give a compromise between a tendency to bend under thermal or physical load and minimum weight to keep the inertia as low as possible.

The roll surface is initially turned and then ground with e.g. a 320 grit finish. Subsequent to this the ceramic coating (5) is applied. In particular, this is effected by initially depositing a 0.005" metal layer of nickel aluminide by thermal spraying, subsequently laying down 0.010" of a compound powder (cermet) 70% aluminium oxide/30% nickel aluminide, and then finally spraying on to the latter magnesium zirconate to a thickness of 0.010". After cooling naturally to room temperature the ceramic surface is then finished by linishing with fine silicon paper.

Worn rolls may be re-furbished in much the same manner, the old coating being removed by shotblasting, air chiselling etc. the surface being re-ground preparatory to the laying down of the fresh coating.

Rolls coated in this fashion exhibit very superior qualities in use and the principal reason for this is believed to be the fact that the coating is applied to a finely ground surface. The application of this coating to a conventional turned surface has been found to be unsatisfactory because the turning 'rings' inevitably formed on the surface create local high pressure lines beneath the coating, and this tends to promote the build up of scale from the hot strip into 'nodules' on the ceramic surface at points in alignment with these high pressure lines; these indent and blemish the strip as it passes over the roll. The precise reason for this build-up at the high pressure points is not fully understood but micro-analysis has revealed the presence of silicon at grain boundaries in the magnesium zirconate which indicates that silicon or a silicate may be acting as an adhesive medium

for the scale particles, at the operating temperatures. In this regard adequate roll cooling is important because as the temperature increases so also does the tendency for greater particle adhesion by silicates.

In accordance with this invention the absence of preferential loading on high spots avoids or substantially mitigates this scale particle build-up.

Clearly it is not essential to utilise flame spraying for depositing the coating, plasma spraying could alternatively be used and various other ceramics or cermets may be deposited and the thicknesses of the coating layers may be different from those exemplified above.

CLAIMS

1. A roll for transporting strip characterised by a surface which has been subjected to the sequential steps of fine grinding, spray coating with at least one layer of a ceramic material and surface finishing by linishing.

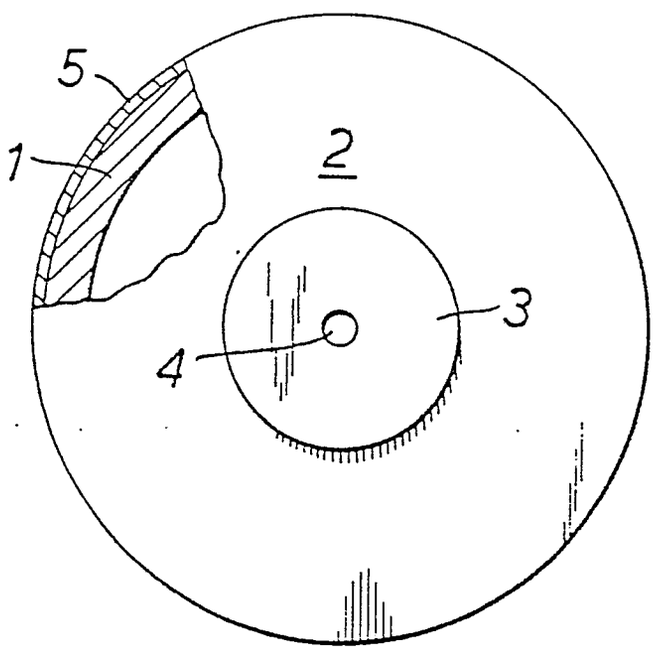
2. A roll as claimed in Claim 1 characterised in that the ceramic coating is applied by sequential deposition of layers of nickel aluminide and magnesium zirconate.

3. A roll as claimed in Claim 2 characterised in that a layer of a compound powder comprising aluminum oxide and nickel aluminide is applied to the roll following deposition of the initial layer of nickel aluminide.

4. A roll as claimed in any one of Claims 1 to 3 characterised in that the roll comprises a tubular steel body into which a cooling medium is admitted.

5. A roll as claimed in Claim 4 characterised in that the tubular steel body is turned and/or shot peened prior to grinding.

6. A method of treating the surface of a roll for transporting strip material which is characterised by the sequential steps of finely grinding the roll surface, spray coating the ground surface with at least one layer of a ceramic material and surface finishing the coated roll surface by linishing.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EUROPEAN SEARCH REPORT

0091292
Application number

EP 83 30 1849

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	GB-A- 879 762 (BLAW-KNOX) * Whole document *	1,6	F 27 D 3/02 C 21 D 9/56 B 65 G 39/07
X	DE-B-1 210 448 (NASSHEUER) * Whole document *	1,6	
A	US-A-2 663 558 (M.N. ORNITZ et al.)		
A	US-A-3 116 053 (C.G. ERICSSON)		
A	US-A-3 907 965 (Y. HOSHINO et al.)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

F 27 D
C 21 D
B 65 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-07-1983	MOLLET G.H.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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